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The Control of Johnson Grass in Sugarcane Fields

By

E. R. STAMPER AND S. J. P. CHILTON



Johnson grass seedling control in summer plant cane. Untreated row on left, control program on right.

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LOUISIANA STATE UNIVERSITY
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AGRICULTURAL EXPERIMENT STATION
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The Control of Johnson Grass in Sugarcane Fields

E. R. STAMPER AND S. J. P. CHILTON

Johnson grass infestations in the sugarcane fields of Louisiana have become a very serious problem in the last few years. It is estimated that at least 100,000 acres of land devoted to sugarcane have become so thoroughly infested that some sort of program such as fallow plowing should be practiced to reduce Johnson grass to a level low enough for a good plant cane crop. Approximately 50,000 acres are so badly infested with Johnson grass seed that reinfestation by seedlings eliminates the effectiveness of a fallow plowing program. Often at the end of the crop cycle, Johnson grass is about as bad as it was before the fallow plowing program was begun. Many more acres of land, while not badly infested, have ditchbanks and headlands covered with Johnson grass.

In 1947, studies were begun by the Louisiana Agricultural Experiment Station to obtain the information necessary for a control program. These have dealt with the populations of Johnson grass seed over the sugarcane belt, the effect of fallow plowing and mowing on the eradication of large plants and their rhizomes, a search for chemicals safe to use in sugarcane fields and suitable for killing both Johnson grass seedlings and large plants, and the combination of these chemicals with certain cultural practices. As information accumulated, it was published (1, 2, 3, 4) so that it would be of immediate value to those who were starting control practices. Further studies will be published as completed.

While much further work needs to be done, it is possible to make certain recommendations based on large-scale tests made in 1949. Figure 1 shows a plot of plant cane where Johnson grass was controlled and one where it was not controlled.

This bulletin gives a summary of the control methods which have been proven safe. It is highly probable that as the work progresses, better chemicals and methods will be found, and the recommended methods will be changed. However, the Johnson grass problem has become sufficiently acute in certain areas that control measures should be put into practice as soon as possible.

Eradication of Large Plants

At present fallow plowing, or continuous plowing in the year sugarcane is not grown, is the cheapest and surest method available for the elimination of large Johnson grass plants and their rhizomes. Approximately 6-11 plowings are necessary for adequate control, and costs are estimated at \$12 to \$16 per acre.



Figure 1.—Johnson grass seedling control in plant cane. Above: Plant cane in August after a control program of 2,4-D plus flaming. Below: Hoed check.

Under certain conditions a crop of corn and beans can be raised and after the corn is harvested, sufficient plowings made to kill nearly all Johnson grass rhizomes. However, large amounts of Johnson grass seed are produced in the corn and bean crop (2) so that seedling reinfestations reach levels where none of the control practices is adequate. For this reason, it is felt that this is not a good practice in areas where Johnson grass seed are produced.

Observations have shown that in many fallow plowing programs the Johnson grass rhizomes are not destroyed in the ditchbank rows. This is due to not plowing sufficiently close to the ditchbanks or not plowing this area as often as the remainder of the field. As a result, when the outside rows are made up they are full of rhizomes which have been brought in from the ditchbanks or which have not been destroyed by the plowing. Care should be taken that the ditchbank be kept as narrow as possible and this area and the ditchbank row be plowed more often than the rest of the field.

Where Johnson grass seed are not present in the soil, fallow plowing should clean up a field. It may be desirable to rogue or spot treat with chemicals to eradicate the plants which have escaped the fallow plowing.

Seedling Control

The control of Johnson grass seedlings is essential on many plantations. Without a program dealing with this phase, the effect of the fallow plowing is in great part lost after the plant cane crop is raised.

Certain terms have come into use with chemical sprays, and for clarity these are defined as used in this bulletin.

Pre-emergence spray: A pre-emergence spray is one applied before weed seedlings have appeared above the ground.

Post-emergence spray: This type spray is applied after the weed seed have germinated and the seedlings can be seen above the ground.

A drill spray is one in which the spray is confined to a band over the row or drill in the immediate area where the cane is growing. It may be any width but is usually 24 to 36 inches wide. It may be applied either as a pre-emergence or a post-emergence spray.

Blanket spray: This spray covers the entire surface of the field, including the drills, sides and middles of the rows.

Acid equivalent: The herbicidal activity of 2,4-D is based on its acid content. Because the straight acid is relatively insoluble in water, the 2,4-D is sold as the amine salt (liquid), the

sodium salt (dry powder), and as the ester (liquid). Companies sell these materials at various strengths. In order to reduce these differences to a standard, all 2,4-D materials are sold with the per cent strength in terms of 2,4-D acid given on the label. In addition the pounds of 2,4-D acid per gallon is given for the amine salt and the ester. In this way it is possible to calculate the amount of a commercial product necessary to supply a given rate of 2,4-D acid per acre.

The following recommendations are given for the control of Johnson grass seedlings. These are for use in fields where rhizomes have been destroyed by fallow plowing and reinfestation from seedlings occurs.

Plant Cane

Fall Treatments

In fields planted before October 1, use a roller or cultipacker of some sort so that the surface of the row is packed smooth.

Apply a pre-emergence drill spray of 2,4-D at the rate of 2 pounds acid equivalent per acre. This spray should cover a band at least 30 inches and preferably 36 inches wide. The actual amount of chemical used per acre would be from 13 ounces to 1 pound depending on the width sprayed. The spray should be applied before the Johnson grass seedlings come up. This treatment will ordinarily be 60-90 per cent efficient, but sufficient seedlings will usually be left to require further control methods. It has been found that a flame cultivation two or three weeks later will kill most of the seedlings that have escaped the 2,4-D treatment. If this is not sufficient, another flaming a week to 10 days later will be of value. It is advisable, if seedlings have begun to appear early, to give another 2,4-D spray after the flame cultivation.

Where a flame cultivator is not available a mixture of 2,4-D (2 pounds acid equivalent per acre) and 6 gallons of an 8-10 per cent pentachlorophenol in oil per acre should be applied as a drill spray before the seedlings that have escaped the initial 2,4-D spray get over 3 inches high. The amount of the pentachlorophenol actually used would be 3 gallons per acre for a drill spray 36 inches wide.

The sides and middles of the row should be cultivated as needed to eliminate the seedlings that are present. Care must be taken that the cultivation overlaps the sprayed area so that there will not be a row of seedlings which have not been destroyed either by the chemical treatment or the cultivation.

One roguing should be made to remove plants from rhizomes not killed by the fallow plowing and from seedlings that have escaped the control program.

Late Planted Sugarcane

Sugarcane planted after October 1 usually does not have many seedlings. A roguing to remove plants coming from rhizomes is of value.

Spring Treatments

Spray the drill with 2,4-D at the rate of 2 pounds acid equivalent per acre as soon as the cane is shaved, or shaved and off-barred, but before the seedlings appear. A flame cultivation should be made two to three weeks later or before the Johnson grass seedlings produce roots.

Another drill spray of 2,4-D should be applied whenever the soil in the drill is disturbed. If flame cultivation is not used, pentachlorophenol plus 2,4-D at the same rate as in the fall should be applied. Care must be taken in the cultivation operations that a row of seedlings is not left between the treated drill and the cultivated area.

Immediately after the layby cultivation a blanket spray of 2,4-D at 2 pounds acid equivalent per acre should be applied.

A roguing should be made before rhizomes are produced by the seedlings that remain.

The approximate cost of the above programs in the fall and spring are estimated as follows:

2,4-D and flaming, including chemicals, application, flaming and roguing—\$9 to \$11 per acre.

2,4-D and pentachlorophenol, including chemicals, application and roguing—\$11 to \$13.50 an acre.

Where pre-emergence sprays have not been used, good results have been obtained where a spray of 2,4-D was applied and a flame cultivation made one week later. Where necessary another flame cultivation one week after the first one has increased the efficiency of control still further. This method has worked with seedlings 3 to 5 inches tall.

Stubble Cane

It has been observed that if plant cane is kept free of Johnson grass, the first stubble will start out clean. If it is desired to kill the Johnson grass plants that have escaped the control program in plant cane, two chemicals are available for spot treatment. These are sodium chlorate plus calcium chloride as a safener, and sodium or ammonium trichloroacetate (TCA). Amounts that gave good results in 1949 are (1) two pounds of sodium chlorate plus one pound of calcium chloride per gallon of water, and (2) one pound of 100 per cent equivalent TCA per gallon of water. The mixture should be sprayed on the Johnson grass plants when

they are large enough to stand out from the sugarcane, which will usually be by the time they first head. The sodium chlorate mixture is cheaper but the trichloroacetates are less harmful to the cane and soil in the treated areas. The strengths of the chemical solutions given are too great for use except for spot treatment of stools in a field.

It is probable that a 2,4-D application on the drill following shaving, a flame cultivation or a pentachlorophenol plus 2,4-D application before the seedlings get too tall, and a layby blanket spray of 2,4-D would be of sufficient value in preventing further infestations by Johnson grass seedlings and controlling other weeds to justify their use in stubble cane.

Sodium chlorate in badly infested stubble cane was tried in 1949. Results were very erratic, and further studies are necessary before recommendations for its use can be made.

Ditchbanks and Headlands

The eradication of Johnson grass on ditchbanks and headlands will be of value when a control program has been started in the fields and it is seen that it will work.

At present sodium chlorate is the cheapest chemical for use on a large scale. Experiments indicate an application of at least 600 pounds of sodium chlorate (Figure 3) per square acre is necessary for good kill of the Johnson grass rhizomes, although 450 pounds per acre has worked in many cases. Best results seem to be obtained if the chemical is applied when the Johnson grass has headed. It should be applied in 400-450 gallons of water per acre.

Sodium chlorate is inflammable when it dries and is in contact with organic matter. Calcium chloride should always be added to the sodium chlorate at the rate of $\frac{1}{2}$ pound of calcium chloride to 1 pound of sodium chlorate. It should not be sprayed around wooden buildings, and operators on the sprayers should wash their clothes at the end of each day to remove the sodium chlorate. Otherwise, they might catch fire.

The cost per acre for the sodium chlorate-calcium chloride mixture at 11c per pound for the first chemical and 3c per pound for the second one is about \$75. Translated into ditchbank area, the chemicals needed for a ditch 8 feet wide would cost \$72.80 a mile, or \$2.90 a running acre. If close fallow plowing is practiced and the ditchbank is narrowed to 6 feet, the cost for chemicals would be approximately \$54.50 a mile, or \$2.20 a running acre.

If properly applied, spot treatment to kill missed plants should not be more than a sixth of the original cost.



Figure 3.—Johnson grass control on ditchbanks. Above: Infested ditchbank before treatment. Below: Six months after treatment with sodium chlorate at 600 pounds per acre.

The natural flora which comes in after the Johnson grass is killed should not be mowed for at least one full year after application of the chemicals. This will prevent seed from germinating in the soil as the sodium chlorate leaches down.

Chemicals are expensive and where they are used, the areas to be treated should be reduced to the minimum by close and continual plowing.

Sprayers

There are a number of sprayers on the market which can be used in cane fields. Some come with wheels and others can be carried in cane carts. Three rows seem to be the maximum that can be sprayed efficiently at one time.

Sprayers to be selected depend on whether they are to be used in the cane fields or on the ditchbanks, or for both purposes, since the amount of water used per acre is different. It has been found that as little as a half gallon of water per acre can be used to apply 2,4-D, but the less water used, the greater difficulty there is in getting even application of the chemical. For applying 2,4-D, or pentachlorophenol plus 2,4-D, a sprayer should be large enough to apply 40 to 100 gallons per acre as a blanket spray. This amounts to 20 to 50 gallons per acre for a 36-inch drill spray. The fan type nozzle, which produces a fan-shaped spray pattern, seems to give better results than the cone type nozzle, from which the spray emerges as a hollow cone.

One 3-row sprayer can cover from 20 to 40 acres a day. Sufficient spraying equipment should be available to keep up with the shaving and off-barring operations, since a difference of 4 to 5 days in spraying may make considerable difference in the control obtained.

If ditchbanks are to be sprayed, it will be necessary to have a pump capacity on the sprayer capable of putting out 400-450 gallons of water per acre, and the tank should be large enough that it will not have to be refilled too often. Spray nozzles will have to be larger than those used to spray the fields. Sodium chlorate and the trichloroacetates are very corrosive and all sprayers should be washed out each evening after these materials are used.

When a sprayer is first purchased it is necessary to determine how much chemical to add to each tank of water. The simplest method is to fill the tank and spray a known area of land with the nozzles to be used and at the desired speed. Determine the amount of water used by filling the tank again, and calculate the amount of water sprayed per acre. Add enough chemical to give the rate

desired per acre to each tank of water. For example, if a sprayer holds 200 gallons and sprays 40 gallons of water per acre as a blanket spray, 10 pounds acid equivalent of 2,4-D should be added to each tank of water. Two hundred gallons (tank capacity) \div 40 gallons (sprayed per acre) = 5 acres \times 2 pounds acid equivalent (rate 2,4-D per acre) = 10 pounds 2,4-D acid equivalent per tank of water. Once this is determined, the sprayer can be used for blanket or drill spraying by closing or removing nozzles. Pressures in the line must be watched and kept the same as originally used for the calibration.

Most of the amine salts of 2,4-D are 40 per cent acid equivalent and carry 4 pounds of 2,4-D acid equivalent per gallon and 1 quart equals 1 pound acid equivalent of 2,4-D. The sodium salt is sold in varying strengths and Table 1 gives the amounts necessary for 2 pounds acid equivalent per acre.

Precautions should be taken with all chemicals. 2,4-D in particular should not be sprayed near gardens and valuable broadleaf plants. Sodium chlorate should not be sprayed around wooden buildings.

Table 1. Amount of product of the sodium salt of 2,4-D to be used to give 2 pounds acid equivalent per acre as a blanket spray

Acid equivalent sodium salt of 2,4-D % acid	Amount of product per acre	
	Lbs.	Ozs.
50	4	0
55	3	10
60	3	5
65	3	1
70	2	14
75	2	11
80	2	8
85	2	6



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